CLAIMS

What is claimed is:

1. A method for forming an improved fuse link structure comprising the steps of:

providing first and second metal interconnect structures each respectively electrically interconnected to form fuse interconnect portions extending through a plurality of dielectric insulating layers including an uppermost metal interconnect layer;

forming a dielectric insulating layer over the uppermost metal interconnect layer;

forming at least a second dielectric insulating layer over the first dielectric insulating layer;

forming first and second trench to respectively overlie the first and second metal interconnect structures;

forming first and second via openings extending from a bottom portion of the respective first and second trench line openings through the dielectric insulating layer to overlie the respective first and second metal interconnect structures while simultaneously etching away a predetermined thickness of the at

least a second dielectric insulating layer spanning an area between and overlying the first and second via openings; and,

filling the first and second via openings and first and second trench line openings with a metal to form a metal fuse link electrically interconnecting the first and second metal interconnect structures to form a metal fuse link portion comprising the predetermined thickness.

2. The method of claim 1, wherein the second dielectric insulating layer comprises a lowermost dielectric insulating layer and an uppermost dielectric insulating layer separated by an etch stop layer formed at a level comprising the predetermined thickness.

3. The method of claim 1, wherein etch stop layers are formed to separate the first dielectric insulating layer and the at least a second dielectric insulating layer.

4. The method of claim 1, wherein a metal interconnect guard ring structure is formed in parallel to surround the fuse link and the fuse interconnect portions to extend downward through at

least a portion of the plurality of dielectric insulating layers.

5. The method of claim 1, wherein a bottom anti-reflectance coating (BARC) comprising one of an organic and inorganic material is formed over and contacting an uppermost layer of the at least a second dielectric insulating layer.

6. The method of claim 1, wherein the plurality of dielectric insulating layers comprise a low-K inorganic material selected from the group consisting of fluorine doped silicon oxide, carbon doped silicon oxide, and organo-silane glass (OSG).

7. The method of claim 1, wherein the metal is selected from the group consisting of copper, aluminum, and alloys thereof.

8. The method of claim 7, wherein the metal consists primarily of copper.

9. The method of claim 8, wherein the step of filling further comprises the steps of:

depositing at least one of a refractory metal and refractory metal nitride to form a barrier layer lining the respective via and trench openings;

depositing a copper seed layer over the barrier layer;

carrying out an electro-chemical deposition process to fill the respective via and trench openings; and

carrying out a chemical mechanical polishing process to remove excess copper overlying respective trench opening levels.

10. The method of claim 1, wherein the predetermined thickness is from about 1500 Angstroms to about 5000 Angstroms.

11. The method of claim 1, wherein the predetermined thickness is from about 2500 Angstroms to about 3500 Angstroms.

12. The method of claim 1, wherein the first and at least a second dielectric insulating layer are formed of a material selected from the group consisting of undoped silicate glass (USG), CVD silicon oxide, PECVD silicon oxide, and TEOS silicon oxide.

13. The method of claim 1, wherein the etch stop layer is selected from the group consisting of silicon carbide and silicon nitride.

14. The method of claim 1, wherein the at least a second dielectric insulating layer is formed at a thickness of from about 10000 Angstroms to about 40,000 Angstroms.

15. A fuse link structure comprising:

at least one fuse comprising two conductive fuse interconnect structures extending through a plurality of dielectric insulating layers;

a metal filled dual damascene provided overlying the conductive fuse interconnect structures provided within a first via portion dielectric insulating layer and at least one

overlying trench line portion dielectric insulating layer;

said metal filled dual damascene spanning an area overlying and between the conductive fuse interconnect structures to form an electrically continuous fuse link between the conductive fuse interconnect structures;

wherein the fuse link comprises a relatively thinner fuse link portion formed at a predetermined thickness overlying a relatively thinner portion of the at least one trench line portion dielectric insulating layer.

16. The fuse link structure of claim 15, wherein the at least one trench line portion dielectric insulating layer comprises a lowermost and an uppermost dielectric insulating layer separated by an etch stop layer disposed at a level comprising the predetermined thickness.

17. The fuse link structure of claim 15, wherein the predetermined thickness is from about 1500 Angstroms to about 5000 Angstroms.

18. The fuse link structure of claim 15, wherein the predetermined thickness is from about 2500 Angstroms to about 3500 Angstroms.

19. The fuse link structure of claim 15, wherein the metal is selected from the group consisting of copper, aluminum, and alloys thereof.

20. The fuse link structure of claim 15, wherein the metal consists primarily of copper.

21. The fuse link structure of claim 15, wherein etch stop layers are formed to separate the first dielectric insulating layer and the at least a second dielectric insulating layer.

22. The fuse link structure of claim 15, further comprising a metal interconnect guard ring structure surrounding the fuse link and the fuse interconnect structures to extend downward through at least a portion of the plurality of dielectric insulating layers.

23. The fuse link structure of claim 15, further comprising a bottom anti-reflectance coating (BARC) overlying and contacting an uppermost layer of the at least one trench line portion dielectric insulating layer.

24. The fuse link structure of claim 15, wherein the plurality of dielectric insulating layers comprise a low-K inorganic material selected from the group consisting of fluorine doped silicon oxide, carbon doped silicon oxide, and organo-silane glass (OSG).

25. The fuse link structure of claim 15, wherein the first via portion dielectric insulating layer and the at least one overlying trench line portion dielectric insulating layer are formed of a material selected from the group consisting of undoped silicate glass (USG), CVD silicon oxide, PECVD silicon oxide, and TEOS silicon oxide.

26. The fuse link structure of claim 16, wherein the etch stop layer is selected from the group consisting of silicon carbide and silicon nitride.

27. The fuse link structure of claim 15, wherein the at least one overlying trench line portion dielectric insulating layer is formed at a thickness of from about 10000 Angstroms to about 40,000 Angstroms.